A "Substitute Specification and Abstract" is submitted herewith to place the application in somewhat better English form. The "Substitute Specification and Abstract" contains no new matter. In order that the examiner can satisfy himself in this regard, also submitted herewith is a marked-up copy of the original specification and abstract, from which the "Substitute Specification and Abstract" was typed.

The examiner will note that the claims have been amended to substitute the word "nitriding" for "reforming." See page 19, line 1 of applicants' original specification.

The examiner will note that new claim 26 is presented in place of cancelled claim 2.

The rejection of claims 1, 4, 6, 7 and 13 for anticipation by Jain et al as set forth in paragraph 2 of the office action, is respectfully traversed. As the examiner correctly notes, Jain et al form a plasma gas that contains nitrogen and expose a copper layer to that plasma in the process of creating "a diffusion preventing layer." However, the plasma of Jain et al additionally contains an alkylsilane. Jain et al very clearly describe their process as a plasma assisted chemical vapor deposition (CVD). Accordingly, the "diffusion preventing layer" of Jain et al to which the examiner refers is the layer deposited by CVD <u>on</u> the copper. In the context of the language of original claim 1, Jain et al do not teach or suggest <u>reforming</u> a surface portion of a copper wiring layer to make a "copper diffusion preventing layer." In the context of the language of the claims as amended here, Jain et al neither teach nor suggest nitriding of a surface portion of a copper wiring layer. Also note that applicants' claims have been amended to exclude an

additional reactant such as a silane. Thus, Jain et al deposit a diffusion preventing layer on the copper whereas the present inventors convert a surface portion of the copper layer into a diffusion preventing layer by a nitriding reaction. Thus, the chemistry and effect of the present invention are very different from the chemistry and effect of Jain et al.

The rejection of claims 2, 3 and 13 for obviousness over Jain et al is respectfully traversed for the same reasons set forth above. Additionally, it should be noted that the silanes of Jain et al would not be considered "hydrocarbons" by those skilled in the art who correctly understand the term "hydrocarbon" to mean a compound composed of hydrogen and carbon only." In this art silanes and hydrocarbons are not analogous, e.g., a hydrocarbon cannot be substituted for the silane Jain et al use to form their amorphous layer. Also note that claim 3 is limited to two specific hydrocarbons in no way suggested by Jain et al and that new claim 26 is limited to CxHy. See page 11, line 23 to page 12, line 6.

The rejection of claims 5 and 8 for obviousness as set forth in paragraph 6 of the office action is respectfully traversed for the reason that the rejection of claim 1 is traversed above. Even if the cleaning step of Islam et al were to be added to the process of Jain et al the result would still not be a reforming or a nitriding of a surface portion of a copper wiring layer.

Likewise, the rejection of claim 12 for obviousness as set forth in paragraph 7 of the office action is respectfully traversed for the same reason that the rejection of claim 1 is traversed above. Again, Jain et al form a CVD layer <u>on</u> the copper wiring and nowhere suggest reforming

or nitriding a surface portion of the copper wiring.

In conclusion, it is respectfully requested that the examiner reconsider the rejections of record with a view toward allowance of the claims as amended.

Respectfully submitted,

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1. (Amended) A semiconductor device manufacturing method comprising the step of:

converting into a plasma [plasmanizing] a process gas selected from the group consisting of [containing any one of] N_2, [and] N_2O and mixtures thereof; and

nitriding [reforming] a surface [layer] portion of a copper wiring layer to convert [make] the surface [layer] portion into a copper diffusion preventing layer by exposing a surface of the copper wiring layer to the [plasmanized] process gas plasma.

3. (Amended) A semiconductor device manufacturing method according to claim 26 [2], wherein the hydrocarbon is [any of] CH_4 or [and] C_2H_2.

4. (Amended) A semiconductor device manufacturing method comprising the step of:

converting to a plasma [plasmanizing] a process gas consisting of [containing] N_2 and NH_3; and

nitriding [reforming] a surface [layer] portion of a copper wiring layer to convert [make] the surface [layer] portion into a copper diffusion preventing layer by exposing a surface of the copper wiring layer to the [plasmanized] process gas plasma.

5. (Amended) A semiconductor device manufacturing method according to claim 1, further comprising the step of:

exposing the surface of the copper wiring layer to a NH_3 plasma before the surface [layer] portion of the copper wiring layer is nitrided [reformed].

6. (Amended) A semiconductor device manufacturing method according to claim 1, further comprising the step of:

forming a silicon-containing insulating film on the copper wiring layer after the surface [layer] portion of the copper wiring layer has been nitrided [is reformed].

7. (Amended) A semiconductor device manufacturing method according to claim 6, further comprising the step of:

converting [plasmanizing] a process gas containing at least one of NH_3, N_2, and N_2O into a second process gas plasma; and

after forming the silicon-containing insulating film, exposing the silicon-containing insulating film to the second [plasmanized] process gas plasma.

8. (Amended) A semiconductor device manufacturing method according to claim 6, further comprising the step of:

forming an interlayer insulating film on the silicon-containing insulating film;

forming a via hole in the silicon-containing insulating film and the interlayer insulating film;

burying a plug connected electrically to the copper wiring layer in the via hole; and

forming an upper wiring layer, connected electrically to the plug, on the interlayer insulating film.

12. (Twice amended) A semiconductor device manufacturing method according to claim 8, wherein the interlayer insulating film is a [any one of an] FSG film or [and] a porous SiO_2 film.

13. (Twice amended) A semiconductor device manufacturing method according to claim 6, wherein the silicon-containing insulating film is [any one] selected from the group consisting of an SiOCH film, an SiO film, an SiN film, an SiONCH film, an SiCH film, and an SiCNH film.